

two maps representing the "Florareiche" and the "Faunareiche" respectively. Much might be said with respect to the divisions adopted by the author, but space forbids.

The book is abundantly illustrated, and most of the illustrations are well selected and quite to the point; but exception might perhaps be taken to some of the pictures in which the author attempts to represent as many types as possible in one plate, with the usual consequence that the *ensemble* looks unnatural and untrue. The map showing the distribution of the European species of *Asplenium* (p. 89) is not very illustrative and scarcely in place; whilst Kerner's maps dealing with *Tubocytisus* (pp. 90, 91) require thorough revision, although they are excellent so far as method is concerned.

OTTO STAPP.

FOUNDATIONS OF AGRICULTURE.

Agricultural Botany—Theoretical and Practical. By John Percival, M.A. (Cantab.), F.L.S. Pp. xii + 798. (London: Duckworth and Co., 1900.)

THE professor of botany at the South-Eastern Agricultural College at Wye has done well to depart from the utterly inefficient standard of text-books in this subject hitherto set and followed in this country; and, although we do not think the best possible has yet been produced, the present work is so distinctly an improvement, and so clearly sounds the right note, that we have no hesitation in recommending it as *the* elementary handbook for the agricultural student. What it lacks most conspicuously is a clear enunciation of the principle underlying the teaching of botany to students of agriculture, and it will be just as necessary for the teacher using this book, as it is for him who uses others, to emphasise the point of view (lost sight of in nearly all our text-books) that the plant is a focussing centre in which are concentrated the materials gathered by roots and leaves and the solar energy fixed by the chlorophyll-action, so that plant substance—be it in a cabbage, a potato, a crop of wheat or an oak forest—represents a real gain of energy from the surrounding universe, stored up with an equally real recovery of material which would otherwise have been lost to us because dissipated into the atmosphere in an unavailable form. It is this which makes farming, planting, forestry and other branches of agriculture so fundamentally different from the mining industries, where the coal, iron, &c., brought from their storehouse in mother earth are merely temporary sources of wealth representing expenditure of capital.

As regards features of technical detail, there are several interesting departures from the repetitions of previous text-books, and our chief regret is that these are not more original in conception and treatment. For instance, the section on recognition of trees and shrubs by means of twigs in winter is a very welcome one, but it might have been made far better. Again, the part dealing with our common grasses could have been improved by bolder departures from, and less reliance on, Continental and other authorities in common use, though it should be pointed out that the author has, at any rate, provided new drawings of the "seeds" of most of

the grasses. This, however, not always with advantage—*e.g.* the very bad figure (210) of Yorkshire fog. Nor do we regard the summary of characters leading to the recognition of grasses by their leaves as either adequate or worthy of the scope of the book; it might have been made much better with a little attention to points not included in ordinary pamphlets on the subject.

These are faults to be remedied in later editions, and must not be allowed to outweigh the really excellent portions of the book dealing with the various large groups of cultivated farm-plants—*e.g.* Chapter xxv., dealing with the hop, is well done, as are Chapters xxxiv.–xxxviii., dealing with those very difficult subjects, the varieties of our cereals. Indeed, we may commend the whole of this part of the work which treats of the classification and special botany of farm crops, with few reservations, such as those hinted at above, as an admirable summary of what the student should direct his attention to in this department of his studies. The general botany is also fairly well done; and although we do not consider the section on "Internal Morphology" quite happy either as regards selection of subjects or treatment of details, we have little but praise for the part dealing with physiology, which is so markedly in advance of the stuff we are too apt to meet with in existing agricultural text-books in this country, that we prefer to dwell only on its merits. The chapters on weeds and on diseases of farm-plants are also distinctly better than those in any previous English works dealing with agricultural botany, and we heartily congratulate the author on his exhibition of capacity in the rôle of a teacher of elementary students of agriculture. At the same time, we would point out that much may be done in future editions to improve this subject, and still more in improving and extending the account of the doings of bacteria in the soil. The agricultural student ought to be made to realise that the soil is a matrix, in which the rocks and salts, water and other lifeless constituents, play little more than the subordinate parts of a skeleton or scaffolding, on and between which the real work of conversions, transferences, destructions and constructions of materials necessary for the life of higher plants are being carried out by lower organisms of many different kinds. A vivid picture of the struggles of root-hairs for salts and oxygen, of the relations between anaërobic and aërobic organisms, of the dangers of attack from parasites here, and of the missing of advantageous connections with symbiotic helpmeets there, and of the mutual interactions of the living and non-living factors in keeping up the "fertility," moisture, heat, &c., of the complex soil, would be a fitting subject for a chapter designed to knit together the enormous number of facts here thrown down before the unwary student, and among which he is sure to stumble and flounder.

The ideal here sketched is not an easy one to attain, and we are aware that facts are coming in every day, and that our knowledge of the factors concerned is still in its infancy. Nevertheless, it is no empty compliment to the author to point out that there are indications in the present book that he would be quite capable of putting the crown to his really excellent attempt at an elementary text-book for agricultural students,

by adding a chapter which should drive home to this somewhat apathetic class of learners that botany is no longer to be looked upon by them as a luxury or hobby, or as an interesting adjunct to the study of agriculture, but it must be regarded as *the* fundamental science on which all agricultural operations must be based; and such a chapter should make it perfectly clear that the neglect of the principles and facts it embraces is going to spell ruin in the future, just as the intelligent appreciation of its teachings is going to render the properly trained and equipped planter, forester or farmer, master of the situation his forefathers misunderstood.

OUR BOOK SHELF.

Surveying and Exploring in Siam. By James McCarthy, F.R.G.S., Director-General of the Siamese Government Surveys. Pp. xii + 215. (London: John Murray, 1900.)

ABOUT the year 1880 the Siamese Government became convinced of the necessity of accurate surveys for frontier delimitation, and then it was that Mr. McCarthy commenced the long series of explorations which are recorded in the present work, and which have won for him the gold medal of the Royal Geographical Society. To the student of Indo-China, Mr. McCarthy's book is full of extremely valuable information regarding the aboriginal and mountain races of the highlands of the interior, with whom the nature of the author's work brought him into constant contact. Mr. McCarthy has a sympathetic eye for his fellow travellers, and a kindly word for all but the most obstructive of the native officials. From obstruction by this class, the officers of the Siamese Survey have indeed suffered probably more than any other European officials of the Government; inasmuch as the Survey was practically the pioneer department of the modern régime, and it had to contend against the whole of the forces of conservatism, superstition and suspicion which were at the outset arrayed against all innovation of the kind. Against these, for many years, Mr. McCarthy battled almost single-handed, carrying out meantime slowly and laboriously the triangulation of the frontier districts, and himself training his own assistants. The physical difficulties of the country, which can only be thoroughly appreciated by those who have experienced them, and the inevitable sickness which attacks all who spend the wet season in the jungle, further delayed and hampered the work. The author makes light of the difficulties which had to be overcome, but those who read between the lines will see how formidable they were.

As may be supposed, the book is in no way popular or sensational, and the author's dry, matter-of-fact style does not lend itself to picturesque narrative. Yet politics on the north-eastern frontier of Siam during the incursions of the Haw bandits, in the 'eighties, were exciting enough. If one desired to be critical, one might say that the book is composed of short sentences and scrappy and incomplete descriptions. Yet these faults will be condoned by all who take an interest in scientific geography for the sake of the admirable scientific results of Mr. McCarthy's work. And those who seek to know more of the magnificent plateau of Teng, the highest peaks of Indo-China, or the very interesting hill tribes, such as the Ka, Lamet, Meo and Yao, and the Southern Shân races generally, will find more accurate information in the present work than in any other we are acquainted with.

An excellent index, triangulation charts, and a map of Siam in two sheets, with a number of illustrations, complete a work which forms an important addition to the bibliography of Eastern Asia.

Church Stretton. Vol. i. *Geology*, by E. S. Cobbold; *Macro-Lepidoptera*, by F. B. Newnham; *Molluscs*, by Robert A. Buddicom. Edited by C. W. Campbell-Hyslop. Pp. 196. (Shrewsbury: L. Wilding.)

THIS is an excellent piece of work, and reflects much credit upon those who originated the idea of preparing an account of the scientific features of the Church Stretton district, and also upon the contributors, editor and publisher of the present volume. Church Stretton is a market-town about twelve miles south by west of Shrewsbury, Shropshire, and has a population of about 2000. The district is interesting from a geological point of view, and Mr. Cobbold's notes (which occupy the greater part of the book) will be valuable to geologists visiting it for the first time, and will also give residents a new interest in their rambles. Most of the fossiliferous localities and the main rock exposures are mentioned or described, so that any one interested in the geological and topographical characteristics can readily find them.

Mr. Newnham gives a descriptive catalogue of the macro-lepidoptera found in the neighbourhood of Church Stretton. The district is a fair field and good hunting-ground for the entomologist, many insects being found in it which do not occur in the lower-lying parts of Shropshire. Future collectors will find the catalogue exceptionally valuable, and will doubtless be able to supplement it.

A list of the land and fresh-water molluscs, with notes on the habits of each species and its comparative local scarcity and abundance, is given by Mr. R. A. Buddicom. The total number of species of British land and fresh-water molluscs is reckoned at 138 (not counting slugs) of which 42 have been found in or near Stretton. A plate containing illustrations of 37 species, natural size, photographed from actual specimens, accompanies Mr. Buddicom's paper.

Other monographs, on the botany, archaeology, climatology and ornithology of the district, are in preparation, and if they are of the character of this one they will afford pleasure to every resident or visitor in Church Stretton who has an interest in the study of outdoor nature. The district is fortunate in possessing such a useful guide to its natural characteristics.

Surveying with the Tacheometer. By N. Kennedy. Pp. vi + 104. (London: Crosby Lockwood and Son, 1900.)

THIS handy little volume is put forward in the hope of bringing the tacheometer into more general use among land surveyors, its present position in the background being due chiefly, the author thinks, to the fact of the Continental instruments having hitherto been provided with circles divided with 100° to a right angle, instead of 90°, thus necessitating special reduction tables. The publication of a universal method of reduction, no matter what the division value, by Mr. G. Gilman removes the greater part of these objections.

The tacheometer is first minutely described, excellent illustrations being provided for reference, the only essential difference from a good transit theodolite being the insertion of a subsidiary lens between the objective and eye-piece, which, by special adjustment, enables the angular distance between two wires in the eye-piece to be made equal to any desired quantity, decided by calibration on a previously measured base. Subsequent sections deal with the variations introduced by working on inclined ground, details of actual field and office work, concluding with some suggestions on possible methods of utilising existing transit theodolites for tacheometric work. Examples of entries in field-book, plans of surveys, &c., are given at the end of the book. The work is very clearly written, and should remove all difficulties in the way of any surveyor desirous of making use of this useful and rapid instrument.